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INDUSTRIAL AND COST ACCOUNTANTS OF CANADA

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• EDITORIAL •

Purchasing Policy and the Seller's Market

The cost accountant cannot do very much in the matter of purchasing policy, but his running mate in keeping down operating costs, the purchasing agent, may be able to make a contribution in the battle against the common enemy, rising costs.

Ever since 1939 we have had a sellers' market in most of the things we buy. In the period from the beginning of the war to the present time we have seen some of our normal purchases become unobtainable and many others come into such short supply that they have been subject to rationing by the government or unofficially by the supplier. The inevitable result has been a thorough-going sellers' market in most goods.

This has made the purchasing agent's job increasingly difficult. In most cases he has found it necessary to abandon his typical role as a tough, hard-to-please buyer, and to assume many of the characteristics of a salesman. He has had to keep on good terms with his suppliers, and he has had to accept a good many transactions with good grace which he would under ordinary circumstances scorn.

As an almost inevitable result of these conditions many companies purchasing policies have undergone great changes. This has not been the result of a change in reasoning on the part of management, but has simply mushroomed up of its own accord out of the seeds of changing business conditions.

The question naturally arises as to when the sellers' market will end, and the buyer have his turn again, and as to what circumstances will bring about the change—back to what most of us consider the normal, healthy buyer-seller relationship. Naturally, part of the answer lies in the relationship of demand for and supply of the various goods. But it seems to us that there is another important factor, a partly psychological one, which could have an important effect on the market. That factor is a general overhaul of purchasing policy.

It seems to us that a scrutiny of purchasing policy might reveal that some of the iniquities of the war years and immediate post-war period have been carried over into 1948 simply because they have beome a generally accepted part of to-day's business methods. In some fields it is still necessary to practice war-time purchasing methods, but in many others they should be only an unpleasant memory.

One important way in which purchasing policy can be returned to normal is to insist that all orders wherever possible be placed on the basis of competitive bids. Such action has the obvious advantage of putting the buyer in a position to make the most favourable deal, and has also the advantage of the psychological effect on the seller. This latter advantage is difficult to evaluate, but it seems reasonable to believe that in the

long run a concerted policy of asking for competitive bids would have its effect on sellers.

Another way in which we might get our purchasing policy back to normal would be to avoid wherever possible that war-born plague, the "cost plus" contract. Another war-baby which might well be abandoned wherever possible is the escalator clause. Under to-day's price and delivery conditions it is not possible to avoid escalator clauses in many purchase contracts, but they should be minimized and their terms scrutinized carefully. These and other practices which have crept into our purchasing policy might well be reviewed.

There is nothing very profound in these suggestions—they are just generally accepted good business practice; but it is a form of good business practice which many of us have just got out of the habit of putting to use. Now might be a good time to fashion our purchasing policy as closely as possible after the methods in use before the sellers' market appeared. By so doing, perhaps we can hasten its demise.

Economic Indicators

The index of industrial production moved up to 185.2 (1935-39:100) in April, compared to 177.8 and 181.6 in January and February, 1948, and 165.8 in April two years ago. Railway freight loadings have continued their steady position.

The cost-of-living index reached a new high of 153.3 (1935-39:100) in May, compared to 148.3 and 150.1 in January and February, 1948, and 122.0 in May, 1946. The index of wholesale prices reached 148.5 (based on 1926) in April, compared to 146.9 and 147.3 in January and February, 1948, and 108.4 in April, 1946.

The trend of business and prices is, as expected, continuing the strong upward trend of recent months.

Our Twenty-Sixth Annual Meeting

For the occasion of our twenty-sixth Annual Meeting we made a return visit to the City of Quebec. Many of the members who attended the Annual Meeting in Quebec in 1944 well remembered the warm hospitality extended to them by the members of the Quebec City Chapter at that time. In making this return visit they looked forward with much pleasure to a repetition of their previous visit, and in no way were their anticipations let down.

The Quebec City members did an outstanding job in making arrangements for our meeting and providing for suitable entertainment for the members and their wives. The meetings were well attended and a large volume of business was carried out with despatch and thoroughness. On Friday afternoon, during the Annual Meeting, the ladies were conducted on a tour of some of the more interesting points surrounding historical Quebec. On Saturday afternoon the members and their wives were conducted on a tour of Quebec City and citadel.

The reports presented at the Annual Meeting will be published in the Year Book which will be sent to the members during the coming month and the technical address presented by Mr. J. A. Fuller entitled "Presentation of Company Information to Shareholders and Employees," and the address of Mr. Gordon A. Ross on the subject of "Economic Problems of Our Time," given at the Annual Dinner will be published in the September issue of "Cost and Management." Both of these addresses contributed much to the success of our Annual Meeting.

New Members

Bay of Quinte Chapter

W. D. Richardson, Lorne McDougall Insurance Agencies Ltd., Belleville, Ontario.

Calgary Chapter

Paul E. Slipper, 1214—19th Ave. N.W., Calgary, Alberta.
Robert L. Jones, 1140—16th Ave. N.W., Calgary, Alberta.
John A. Campbell, 161 River Drive, Bowness, Alberta.

Edmonton Chapter

Clayton A. Griffith, 11330—80th St., Edmonton, Alberta.
LeRoy A. Wood, 9818—92nd Ave., Edmonton, Alberta.
F. Fiorentino, 9728—101st St., Edmonton, Alberta.

Fort William—Port Arthur Chapter

George Williams, Wilsons Typewriter & Office Machines, Port Arthur, Ontario.

Hamilton Chapter

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Leo Bertoia, 326 Locke St. S., Hamilton, Ontario.
John Prior, 291 Grand River Avenue, Brantford, Ontario.

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C. Chamberland, 25 Laurentide Ave., Quebec, Quebec.
Pierre Fortier, 310, rue Grande Allee, Quebec, Quebec.
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J. M. Bedard, Saint-Felicien Cte. Roberval, Quebec.
Jean-Paul Belanger, 120 rue Richelieu, Quebec, Quebec.

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L. Corriveau, 160 rue Marchand, Drummondville, Quebec.
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R. Dela Sablonniere, 1251 Preston Ave., Sillery, Quebec.
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Andre Brunelle, 16 rue Montcalm, Levis, Quebec.
E. Genest, 94 Saint Oliver St., Quebec, Quebec.
J.-M. Bisson, 150½ rue Christophe Colomb, Quebec, Quebec.
Charles-Henri Gagnon, 11 rue de L'Eglise, Montgomency, Quebec.
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Our New President

The Society of Industrial and Cost Accountants of Canada is honoured in having as its new president, Mr. D. R. Harrison, R.I.A., of Port Arthur, Ontario. Mr. Harrison took an active part in organizing the Fort William-Port Arthur Chapter and has been a hard worker in the interests of our Society ever since. In assuming the Presidency of the Society he brings to this office many years of experience as an active leader in various organizations.

Mr. Harrison is Secretary-Treasurer and Business Manager of the Port Arthur News Chronicle. He is very active in civic affairs and presently is Chairman of the Board of the Port Arthur Hospital. He has been very active in educational affairs and held offices in Kiwanis, the Masonic Order and Shriners. We may look forward with much optimism to further progress under the leadership of Mr. Harrison.

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In the 1948 Examinations of the Society, the following students obtained pass standing in the subjects listed:

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T. Ewart, Winnipeg.
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F. Halderson, Winnipeg.
M. Howes, Winnipeg.
H. W. Howland, Stonewall.
J. H. Jonasson, Winnipeg.
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W. G. Mitchell, West Kildonan.
W. L. Moore, East Kildonan.
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K. Redshaw, St. Vital.
L. Y. F. Riddell, Winnipeg.
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N. H. Smith, Winnipeg.
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E. Swain, Winnipeg.
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ACCOUNTING II

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W. C. Buttimer, Toronto.
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Organizational Controls in Industry

Excerpts from an address by General Brehon Somervell, President, Koppers Company, Inc., Pittsburgh, Penna.; given before the 25th General Management Conference of the American Management Association New York, N.Y., at the Waldorf-Astoria Hotel, New York, June 9-10, 1948

It is generally accepted, I believe, that the means of control available to the executive, in addition to organization, include both long range and day to day planning, the establishment of policies and procedures to cover the operations of the company and its sub-divisions, and the submission of periodic and special reports, including statistics, on operations.

The executive can exert a strong control over his organization in the allocation of funds for the activities assigned to the various subdivisions. Control likewise can be exercised through assignment or allocation of personnel to various activities. With such controls over finances and personnel, the activities can be enlarged, restricted, or directed in broad channels.

Once the personnel has been assigned and funds made available, the executive through careful training and orientation of his personnel can guide their actions along the lines contemplated by objectives and programs. Both he and his staff can secure further control over operations through inspections of work in progress and conferences with those charged with the execution of the work. Lastly, the executive by reserving to himself personal approval of specific action in certain fields or under certain conditions, can control effectively the course of his subordinates.

The extent to which this last means of control is used is indicative, to my mind at least, of the excellence of the other controls established for the organization. If most matters must be referred to higher authority for action, delegation has been poor and the progress of the organizaiton will be limited largely to the capacity of one man to make all the decisions and to assimilate the details necessary to make them. A good organization proceeds on an entirely opposite course.

The agents used by the chief executive for the operation of the controls which have been described must, in any large organization, be the heads of the various staff departments which supplement the chief executive in the discharge of his duties. Some of the controls are exercised by the President himself, but most of them must be a specific concern of various staff departments. For example, the Finance Department, whatever it may be called, must be responsible for the compilation of the budget no matter how it may be established, and likewise this department must exercise the control to see that the budgets are effective. Likewise, in connection with its specialized function, each staff department must assume a share of the responsibility for control.

Because of the different types of organization in effect to carry out the many different activities of various industrial organizations, it would be impossible to go into much detail as to which staff department should be used for the exercise of the different controls which are necessary. I

should like, however, to take a few minutes to discuss a concept of which I believe I am the author. That is the use of a special Control Section or Department as a major tool of the chief executive of any organization.

It is quite possible that a similar concept may have come to others but what I have to say to-day is a development of my own experience. Prior to its development and use I had not found its prototype in other organizations, though obviously the actual controls which are assigned to this department will be found in a number of staff departments in many organizations. Perhaps the name "Control" for this department is a bad one. People instinctively resent controls of any nature and a more fortunate selection in name might be "Management Section," or "Management Department."

In short, the Control Section is designed to control not what the company does but the way it does it. It acts as eyes and ears for the chief executive of the company or an operating division with respect to everything that has to do with the way in which the work of the company is performed. Many men who were members of the Control Division of the Army Service Forces are now doing similar work in industrial organizations or in companies designed to give expert advice on management problems to companies without the benefit of such a unit within their own organization. I must say that in my own company the idea was received with a great deal of skepticism and perhaps with a certain amount of resentment. This feeling has disappeared, as is proven by the cordiality with which the members of the Control Section are now received everywhere throughout the organization, the fact that their advice and counsel is sought, and that the head of the Control Section is highly regarded by the heads of all Operating Divisions and Staff Departments.

The work of the Control Section is divided into four main subdivisions: Planning and Policies, Organization, Reports and Statistics, and Procedures. It assists in guiding and co-ordinating performance throughout the company, in appraising results, and in correcting unsatisfactory conditions. It reviews with Staff Departments and Operating Divisions, the objectives and program of the company. It is continuously engaged in guiding and co-ordinating performance through bettering our organization, through the formulation of policies, through the development of inter-unit procedures, through progress reports, and through audits. It assists in correcting unsatisfactory conditions through careful analysis of problems, discussion of their phases with the units involved, and works with them in the development of remedies to be applied.

Control Sections are also present in all of our operating divisions, which perform the same functions for the Vice-Presidents and General Managers in charge of these divisions as does the central Control Section for top management. Control insofar as Staff Departments are concerned, is furnished exclusively by the top management Control Section. Units of the organization use the Control Section facilities for assistance in organization, planning, policy development, procedure design, program development, clearance of information, preparation of special reports, mediation, co-ordination, training, and design of reports.

Authority rests in the president of the organization insofar as the top

management Control Section is concerned, and in the General Managers insofar as the divisional Control Sections are concerned. If a control section ever sought to become a super central staff, its usefulness soon would disappear. Instead of being a welcome visitor in the divisions and other staff departments, it immediately would assume the guise of an inspector and critic, which would promptly minimize if not destroy its effect.

As long as organization and controls are used to bring out the best in executives, to permit them to work most effectively as a team and yet not destroy their initiative, they are of maximum usefulness. Once they begin to serve as a damper on the spirits and enthusiasm of the personnel they become a liability rather than an asset.

All of this sounds very simple, and it is. However, because of the many perplexities in business, the application of the principles in the system which I have just discussed is not always easy. Mr. Dodd has asked me to apply these principles to the solution of some practical, everyday problems, and to that end has furnished me with a number of questions.

The first of these questions concerns the Board of Directors, and asks **what functions should be retained by the Board and what functions delegated to operating management.**

General practice reserves certain functions to the Board of Directors, such as approval of capital expenditures, purchase or sale of capital assets, and approval of the basic objectives and programs of the company and approval of major policies or important proposed transactions. If it retained other functions it would be performing part of the management job, not directly related to its principal assignment—trusteeship.

A question on controls and incentives asks **whether administrative controls and measurements of results should be imposed on subordinates without a provision for financial rewards or penalties.**

There seems to have been developed a feeling that the adoption of administrative controls such as programs, progress reports, etc., must be accompanied by financial incentives or awards as a means of sugar coating this bitter pill. It would be well to remember that normal efficiency and attention to the job still are to be expected in return for a fair base salary. Incentives and rewards are intended to compensate for performance **beyond** normal expectancy, and in turn, to produce such performance. My answer, therefore, is that controls and measurements may be adopted fairly without a system of rewards and penalties.

Another part of this question is concerned with **whether or not incentives can or should be set up for staff or service units whose contribution to profit cannot be readily determined.**

In my opinion, incentives for staff and service units are quite in order. First, we create and maintain these units because we know that their work is necessary, although we realize that we will be unable to measure its exact value. Next, we review the progress and results of the overall company and find it to be beyond expectations and deserving of rewards. Are we now to deny that these staff units made a contribution to these results? If so, we should immediately dispense with them for we have in effect

decided that the results would be the same without them. No reasonable man could defend such logic. He would base staff unit rewards on the overall results they helped to produce.

Job security is certainly something to be desired and ranks high among the factors affecting the worker's attitude and satisfaction with his job. This question asks **how a feeling of job security may be instilled in staff groups so they will not feel that they may be indiscriminately cut off in times of crisis.**

The installation of a spirit of job security among staff personnel may be accomplished through forward planning. Every company should study its "break even point" and lay definite plans for its operations at this and intermediate levels of activity. Such plans will reveal the nature and amount of both staff and operating personnel required under these conditions and will do much to create some measure of job security.

While neither staff nor operating units can hope to avoid some reductions in times of retrenchment, both may be satisfied that their reductions are fairly proportioned and not indiscriminate.

Next, it is asked, **what controls can be established to insure proper redelegation by subordinates and avoid overdelegation, to the point of having idle executives and overworked subordinates.**

This involves a control over organization. In my opinion a Control Section, responsible to the chief executive and delegated the responsibility for organization work, can be of great assistance in assuring him that the delegation of responsibility by his subordinates is proper and effective. Such a group should be employed to make organization studies within the staff and operating units, and to prepare reports of findings and recommendations. In this manner insufficient delegation, excessive delegation and lip service to organization plans, can be detected and corrected.

Can the responsibility and authority of subordinates be defined clearly enough as to scope and degree to avoid friction and misunderstanding?

Part of the answer to this lies in the quality of the organization plan itself. In fact it may be said that unless the organization plan and the duties and scope of the particular jobs can be reduced to a clear written description, the plan probably is fuzzy and undoubtedly will encourage rather than avoid friction. The other part of the answer lies in how thoroughly and how well the various jobs are defined. One important duty of a Control Section is the development and maintenance of an organization manual. A good organization plan, backed by a good manual which is complete and currently revised, can eliminate almost any cause for friction between groups or people except those generated through personal feelings. Of course, there is a certain amount of plain cussedness in some individuals which can be eliminated, if at all, only by a priest or psychiatrist.

Costs for Control in the Munitions Industry

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'Putting Cost Accounting to Work' was the 'Leitmotif' of the second day's technical session of the 27th International Cost Conference held at New York in June, 1946. The selection of such a title seems to imply that perhaps cost accounting did not always fulfill the manifold purposes for which costs are required. The field of cost accounting must be considered from two distinct points of view: the bookkeeping or cost determination side and the cost control or service side. For the last two decades the bookkeeping methods had been channelled more and more into the increasingly important phase of cost control. But the war years had forced cost control out of the driver's seat while cost determination continued to flourish. Instead of being able to translate figures back to the transactions from which they came and draw management's interest and consequently judgment upon them, the cost accountant was compelled to devote his time and efforts to those minute and painstaking details connected with cost determination.

PRINCIPLES OF COST CONTROL

While perhaps such conditions existed or had to exist in many companies, management in many others decided early either to continue the system in effect or to install methods and systems that would present not only adequate cost accounts for cost determination of war contracts, but also permit prompt and efficient control of all phases of production. "Control presupposes effort directed toward a desired result. It differs from costing for profit determination in that it is concerned with the charge at the point of origin, while cost determination is concerned with its disposition." (1) War contract claims with their problems of admissible and inadmissible costs and rate of profit were the ultimate goal of the disposition of costs; often little or no attention was paid to the value of an effective cost control system. Yet those companies which established or continued control methods discovered that these led not only to speedier settlement of war contract claims, but also gave rise to a more advantageous profit margin, for the efficient low cost producer guided by competent cost control information was allowed a higher rate of return than the high cost producer whose participation in the job was being justified solely by the great and urgent need for the goods. Therefore, much more reason existed for the installation of a cost system that enabled management to understand, control, and direct the operation of the enterprise.

The properly designed cost system provides a plan for gathering the detailed information of manufacturing, assembles the cost data in a logical manner so that cost reports can be prepared which serve to guide the deci

(1) "The Uses and Classifications of Costs," NACA Bulletin, Research Series No. 7, May 15th, 1946, p. 947/8.

sions of management. (2) The ultimate aim of cost accounting must be the service feature executed by the chief accounting officer whose responsibility should be to bring all inconsistencies, good or bad, to the attention of management. Cost Control has been defined as "the guidance and regulation of the internal operations of a business, by means of modern methods of costing, through the measuring of manufacturing and sales performance." (3) The principles of cost control have been listed in this order: 1, Workability; 2, Simplicity; 3, Fixing of Responsibility; 4, Measurement of Performance; 5, Preparation of Reports, and 6, Recognition. (4) Some years ago the president of General Motors stated that in order to control, the manager must "analyze, organize, deputize, and supervise." To these four points a fifth one can be added: "recognize."

To carry out these principles of costing was the sincere and honest intention of many managers and controllers. In some warborn industries men with accounting training and background were able to install methods and procedures of which they had dreamed in their previous jobs; others in well established companies were compelled to improvise new schemes to keep up with rapidly rising production schedules of their many products; some companies were forced to turn out entirely new products for which little or no previous shop or accounting experience was available in this country. One such new field of industry was the manufacture and machining of 8" and 240 mm. artillery shells.

SHELL CONTRACT

The manufacture of munitions had always been frowned upon during peace time. As the tempo of the war accelerated, the need for ammunition increased beyond expectations and estimates; many prime contractors were pressed into operating a government-owned plant on a cost-plus-fixed fee basis or other known methods. When in the crucial days of winter, 1944, the "Firepower for Eisenhower" caravan appealed to the workers' pride and patriotism and asked for greater fulfillment of production schedules, the seriousness of the situation was placed vividly before labor and management.

When the Ordnance Department assigned the job of machining 8" and 240 mm. shells to the Budd Company under a fixed price supply contract, management believed that the task assigned to it could be accomplished by studying first the product itself and then organizing, coordinating and executing adequately, efficiently and successfully the problems of plant layout, machine installation, departmental division, as well as the many problems connected with material, labor, overhead and such special costs as tooling and training.

THE PRODUCT

The basic part of a shell, the forging, was manufactured in the foundries of the large steel companines. This forging, a hollow, cylindrical body of steel, weighed approximately 290 lbs. for an 8" and 520 lbs. for a 240 mm. shell, when it was delivered from the mill to the machine shop.

(2) See "Cost Accounting," Clarence L. Van Sickle, Harper & Bros., New York, 1938, p. 17.
(3) "Underlying Principles of Cost Control," J. H. Jackson, **NACA Yearbook** 1938, p. 45.
(4) "Underling Principles of Cost Control," J. H. Jackson, **NACA Yearbook** 1938, p. 46-53.

This rough and very hard body of steel was machined, nosed, heat treated, further machined, and banded to be formed finally into the shape of a shell. After the forging had passed through the various processes, its weight had been reduced to about 156 lbs. for an 8" and 298 lbs. for a 240 mm. shell. The machined shell body was then shipped to Ordnance loading plants for loading with explosives.

PLANT LAYOUT AND MACHINE INSTALLATION

The plant that was used for this shell job, erected by the Defense Plant Corporation in 1942-43, measured 1,800 feet in length and 600 feet in depth. About half of the plant area or 560,000 square feet was given over to the new job. It was decided to set up five production lines, four for the 8" and one for the 240 mm. shell. The length of the building permitted the construction of straight production lines making the layout and the installation of the machinery rather easy compared to other plants in the country. Railroad tracks led directly into the plant so that freight cars could be unloaded near the conveyors while the finished shell could be shipped direct from the conveyors, thereby requiring a minimum amount of handling.

The installation of the machinery and the heat treating furnaces was the first major undertaking. The Plant Engineering Department in conjunction with the Ordnance Department prepared cost estimates on each and every job throughout the entire plant. These estimates were posted to order sheets in the cost department, after a shop order number had been issued by the Accounting Department. All costs from the start were posted thereto. Overhead was charged to the order number on the basis of a pre-determined rate based on labor costs. Weekly comparisons between estimates and actual costs were issued, and the results discussed with the Plant Engineering Department. If it became apparent that the estimate would be exceeded on the basis of the cumulative cost figures, the Ordnance Department would be approached for an increase in the original appropriation or for a transfer of available money from other accounts. These weekly reports for machinery installation costs formed the first step in a series of accounting control methods.

PRODUCTION DEPARTMENTS

Plant layout, machine installation and production processes made the departmentalization of the production departments fall into a definite pattern. The shop was divided into five production departments: Department 1, Roughing; Department 2, Heat Treating; Department 3, Machining; Department 4, Final Machining, and Department 5, Finishing.

The work of Department 1 included loading of the forging from a storage or rail siding onto truck and transporting them to the conveyor, shot blasting of the interior, loading of the forging in the lathe for making rough finish cuts, weighing, inspecting, and disposing of the chips by means of overhead cranes. Department 2 consisted of two heat treating operations: placing nose end of forging into induction heaters, then transferring it to a nose press to form the nose, placing the forging into the furnaces for nine hours, from there passing them through a quench oil bath to the Brinell testing machine and on to a second interior and exterior shot

blast operation. Department 3 included roughing and finishing of the nose, further machining of the outside, stenciling identification, cutting centering base of the shell, roughing of the band groove, waving groove and undercut, followed by inspecting and disposing of the chips. Department 4 consisted of tapping the nose, nicking, marking and milling the staking notch, grinding the Bourrelet, washing, heat treating the copper band, banding the shell, and inspection. Department 5 was responsible for assembling the base cover, turning the copper band, checking the band gauge and concentricity, weighing, inspecting, washing and drying the inside and outside, painting the interior, placing the protective plug in the nose of the shell, transferring to the paint machine, from there to the drying machine, applying the grommet assembly, and finally placing the shell on the conveyors leading to the freight cars for bracing and loading. (5) The flow of the work through these departments has been presented in greater detail so that it will be possible to point out how material, labor, and overhead costs were collected, analyzed and controlled in line with shop methods.

ACCOUNTING METHODS AND CONTROL PROCEDURES

THE MONTHLY PROFIT AND LOSS FORECAST

In most companies the monthly profit and loss forecast constituted the initial report for management's guidance. The first step in the preparation of such a report was the compilation of the Sales figure which in this case was based upon (1) the stage of the installation of the facilities in the shop, or (2) the delivery schedule of the Ordnance Department. Market analysis could not enter here at all. Material, Labor and Overhead costs were computed, based on material and labor unit cost estimates or standards together with a pre-determined overhead rate. But the monthly forecast could only partially guide management in the solution of the manifold and intricate problems confronting it day after day.

THE DAILY PROFIT AND LOSS REPORT

Therefore, in order to exercise the utmost control over all phases of production, a daily profit and loss report was prepared for management by the Accounting Department. This report (see Form No. 1), covering all activities of the previous day, was issued at noon. The preparation and issuance of this daily report required diplomacy, good will, co-operation, efficiency and a well planned system involving many departments and thousands of workers. Indeed, it was not achieved by the mere issuance of the order 'to come through' with the daily report on time. The entire shop, the planning department, timekeeping, payroll, and the cost department as well as the stenographic force had to be geared to this task. But it was accomplished. As a matter of pride and record the figures reported in the statement differed from the actual figures by only one to three per cent. Shop superintendents and department heads received daily such information deemed essential for the efficient conduct of their jobs, while top management received the entire report. Variances and trends were pointed out to the Works Manager who discussed them

(5) A detailed description entitled: "Making 8" Artillery Shells" can be found in **The Houghton Line,**" No. 14, July 1944, p. 25-32 published by the E. F. Houghton & Co., Philadelphia, Pa.

with his superintendents so that they could plan for a better performance or for a different strategy to achieve better results.

The balance of this paper will be devoted to a discussion of the various parts of this daily profit and loss report in order to demonstrate how accounting procedures and cost control methods established themselves as indispensable tools for the guidance of management.

MATERIAL

The final product—the shell—consisted of only a few main parts. Furthermore, the size and weight of the forging made control comparatively easy. However, as management wished to insure itself of control, quantity-and dollar-wise, the material elements were divided into two main classifications in order to arrive at a material cost per shell completed. Material which is generally classified as indirect material was named operational material, while the direct material, which became components of the shell, or material closely connected with it was called associated material.

The Engineering Department analyzed the requirements of the various operations in the production departments with respect to operational material and provided the cost department with this information. Any and all requirements were translated into a cost per unit, per shell, per product, in order to allow issuance of the material control report on a unit basis. This report was issued weekly, and the weekly figures were used on the daily report; price and quantity variances on material costs fluctuated so little that this method sufficed.

A.—DIRECT OR ASSOCIATED MATERIAL

All material was recorded in the stores inventory ledger cards located in the Accounting Department. Actually, the material, particularly forgings, was stored near the conveyors or often placed in production immediately upon receipt. Forgings were identified by a heat lot number indicating vendor and physical properties which were important for heat treating. In case of return to vendors, the lot number served as the only means of identification of the source of the purchase.

The Accounting Department received from the Planning Department production releases on the basis of which the component material was deducted from the stores records and posted to a monthly material withdrawal schedule. Quantities released were not actually delivered from stores but the release was the controlling quantity eventually withdrawn as manufacturing at the particular line position required it. At the end of the month the schedule was totalled and a journal entry prepared debiting the Work-in-Process account and crediting Stores.

Synthetic Lacquer and Solvesso Xylol to paint the external surface, Acid Proof Black to paint the cavity, Oakite and Deoxylite to wash as well as Stencil Paints were withdrawn from stores on a material requisition card as manufacturing warranted it. The material requisition did not state the shell size but the total amount was distributed to material cost on the basis of calculated area of shells painted or washed.

Scrap, chiefly borings and turnings from forgings and bands, was computed on the basis of the weight ticket received in the Accounting Department. The quantity was multiplied by the price received from the scrap dealer, and divided by the number of shells shipped during the week.

Process Losses consisted of shell scrapped after costs had been expended thereon. The Scrap Ticket indicated the operation where spoilage occurred and the costs accumulated were transferred to a separate Process Loss account which in turn was again amatorized on a pre-determined rate. Process losses also included ballistic samples that had to be shipped to Ordnance Proving Grounds.

The item Pack and Load included the lumber and nails required for bracing and packing the shells in freight cars or the material used for constructing palettes. The quantities, based on the size of the cars loaded, was supplied to the Cost Department by the Shipping Department.

B.—OPERATIONAL MATERIAL

Propane Gas, Furnace Oil and Quench Oil were withdrawn from stores on a material requisition prepared by the furnace technician. The withdrawal was not identified with a definite shell size, but cost was distributed on the basis of the overall weight of bands heated or shell heat treated.

The cost of electricity for the induction heaters and the band heating machines was based on the numbers of heaters and furnaces in operation for each shell size. These machines averaged certain hours of heating and idling per day, the current consumed differing for each operation. The Plant Engineering Department reported the weekly K.W.H. consumption to the Cost Department where it was costed on the basis of the K.W.H. charge of the Electric Company. The resultant figure, divided by the weekly number of shells heated or banded, represented the cost per shell for each operation.

Hot forging Agent being variable for the two shell sizes was charged direct to the 8" or 240 mm. line.

Coolant was distributed on the basis of the production of the manufacturing department requiring this material.

Shot for blasting was withdrawn on a material requisition that showed shell size, department, and operation for which it was withdrawn.

Perishable Cutting Tools and Grinding Wheels were distributed on the basis of total withdrawals and total production to date of the departments requiring these tools.

The cost of the Nosing Die Liners was absorbed in the material cost on the basis of the average operational life of the liner.

Thread Cut Oil was withdrawn from stores on a material requisition indicating shell size and department. The cost was distributed on the basis of production to date, detailed as to operational use.

All these calculations were prepared for the weekly material cost report independent from the books. For all material enumerated the Stores Account was credited and Work-in-Process Material was debited with the exception of electricity which was charged into cost as a part of the burden rate.

LABOR

JOB CLASSIFICATION

The previous description of the work in the five production departments indicate the various types of jobs required. While it is customary to classify these jobs as either direct or indirect labor, management decided —also in order to provide the worker with the proper motive for top

performance—(1) to bring all jobs under one interdependent incentive wage plan, and (2) in order to achieve this, to set up a total of four job classifications for all labor performed within the production departments, calling them all direct labor.

Th following job classifications were establsihed:

(1) Production Operator. This general title was used for shop employees working on the production line and whose duties involved the operation of a mechincal, electrical or heating device, and who were required to exercise average discretion and responsibility with respect to such equipment.

(2) Production Worker. The title was used for shop employees whose duties did not regularly involve the operation of any machinery and who were required to exercise only a minimum of discretion and responsibility. These workers were generally giving 'service' to the production operators and thereby partially governing the rate of flow on production materials throughout the shop.

(3) Production Inspector. This classification included all inspectors performing a routine and repetitive type of inspection on production.

(4) Set-up Man. This title was used for the experienced worker who worked from blueprints, engineering drawings and manufacturing process specifications, and who set-up and adjusted machine tools for use by the production operator. He was required to possess a thorough knowledge of the machines and their tools and was responsible for maintaining the quality of the work produced on the machines he served.

SETTING THE STANDARDS

The standards established by the Operating Standards Department in accordance with standard scientific methods and accepted practices, were based on the actual performance of a worker or a group of workers possessing average skill and using average effort while working on machines that were operating under normal conditions. Time factors for fatigue, personal needs, and delays beyond control of the worker were studied and included in the production standard. In its final form the piece work incentive plan was a standard piece work plan developed along conventional lines with each direct labor operation being paid for on the basis of a determined price per piece with a minimum guaranteed hourly rate. Basically the plan conformed to Case No. 4, entitled "Functional Relationships of Elements in Wage Incentive Plans" by J. W. Nickerson, released by the War Labor Board in December, 1944.

As it will be impossible to discuss the construction of all rates, a typical example will be cited: The rate of the production operator loading forgings from storage or rail siding onto the fork truck and hence to the conveyor for shot blast was based on one-half of the total count of the three shot blasting units or any portion thereof. The rate of the shot-blast machine operator was based on two production operators, serving one machine with eight parts. The inspector's rate was based on the count of the total output of the operation of the three shot blast units divided by 4. The production worker's rate was based on one-quarter of the total output of the three units. The rate for the set-up man was based on the combined output of machines under his supervision.

OUTPUT DETERMINATION

At the start of the shift every direct labor employee removed from the clock rack the daily job card which was placed there with his clock card by the factory cost clerk. During the day the employee entered on the job card the number of pieces finished. At the end of the shift the job cards were collected by the cost clerks who posted the count of the pieces finished and actual hours worked to the cost card. After all counts had been entered on the cost cards, the clerk posted the results of the shift to the Production sheet which showed the total production on each operation within the department for that shift. The totals were then posted to the production book, giving total production, less scrap on each operation. The pieces shown between operation had to be the same as the actual inventory on the floor of the department. The figures of the production book were compared with the daily output sheet issued by Production Control. This sheet showed the total pieces produced within the department. The totals shown constituted the correct count for the department and the operational count turned in by the employee could not exceed it. Scrap adjustments were entered from the scrap ticket received from the Inspection Department.

The daily output sheet of the Production Control Department showed the total output on the basis of six control points that were established along the production line. Each department possessed one control point with the exception of Department 1 where an additional one had been added immediately after the first shot blast operation. The over-all control was based on the Releases for shot blast and the shipping reports. The control points formed the count basis for the daily profit and loss report.

VARIANCES

(1) **Make-up and Day Work:** For each operation on the production line a standard rate per piece was paid the employee. The employee was also guaranteed a rate per hour per shift. When the employee failed to produce the number of pieces to pay for hours worked, a Make-up card was prepared to add the balance of money to equal the pay guaranteed. The difference between piece work earnings and guaranty was shown as variance on the report.

(2) **Premium:** This cost was the over-time premium required by law. To learn of the high costs involved when working Saturdays and Sundays, it was decided to show the premium as an excess cost item in the 'Variance' section. With improved methods and greater skill of the individual workman, production schedules were met without resorting to too much overtime work.

(3) **Special Rates:** When the Standards Operating Department considered it necessary to change a rate or add a fraction to a rate for a certain operation, usually on a day to day basis, a red rate slip showing pieces allowed and rate per piece was given to the cost clerk The actual quantity produced by the worker was multiplied by the special rate or its fraction and the product divided by the total pieces produced in the department as per control point.

(4) **Try-out:** This cost was caused by the work of the machine installation crew under the authority of the Plant Engineer. In the initial

stages of installation such labor costs were classified as pre-production costs. As the work progressed and these machines during their trial runs produced good units, even though the machines were run by men of the maintenance department, the cost was picked up as a direct labor cost.

(5) **Laboratory:** Ordnance Requirements called for the continuous checking of the shell in the metallurgist's laboratory. From every heat lot shells had to be completely cut up in order to investigate variations on thickness of wall sections and to obtain a stell analysis for the variable in the temperature of the heat treatment. In order to isolate this cost which would ordinarily be termed a process loss operation, codes were set up and the daily labor charges divided by the production count of departments 2 and 4 in order to arrive at a cost per unit for the day.

TOOLING

One department under the heading 'Labor' on the daily profit and loss report must yet be discussed: Tooling.

The machining of a forging whose original weight is being reduced by approximately 50% in the various processes, required an unusually great amount of cutting tools. In fact, the purchasing of the tools first and later the dressing of the tools were major obstacles to overcome in the successful achievement of the contract. When finally a sufficiently large number of tools had been placed in the shot, the re-grinding or dressing operation was put on a piece-work basis in order to assure full replacement of all tools needed on the production lines. All cutting tools were identified by a four digit number. This number assigned the tool to a definite machine for a certain operation within a given department. The employee dressing these tools reported the quantity of like-numbered tools dressed to the factory cost clerks at the end of the shift. The total labor cost per day was divided by the average production of departments 1, 3 and 5 where cutting tools were used. This cost was then reported on the daily statement.

BURDEN

The construction of an overhead budget has always been a difficult task. As factory overhead represents the aggregate amount of all the various manufacturing expense items which cannot be considered a direct charge to the products or the jobs in the process of production, it is inexpedient, if not impossible in many instances, to allocate a proportionate share of each item to each product manufactured. Yet, from the discussion presented, it has become apparent that the aim has been to arrive at a cost figure which, when divided by the daily total production, would represent the unit cost per shell for one particular day. To achieve this goal, material charges commonly termed indirect material were treated as a direct material item under the title 'operational material'; the direct labor classification included workers whose job is listed ordinarily under indirect labor. Such an 'advance direct charging' of a considerable amount of cost generally included under 'overhead' removed some of the difficulties from the task of compiling the manufacturing expenses. However, in order to allow for the control of the fixing of responsibility of expenses incurred, all departments of the entire plant were, as the daily report indicates, classified

into a productive division and four service divisions: productive service, plant service, general service and administrative service.

The section productive departments included the five direct labor departments discussed above. The classification Productive Services included: Planning, Receiving, Stores, Shipping, Salvage and Inside Material Handling. Plant Service took in: Plant Engineering, Maintenance, Tooling, Plant Protection, Sanitation, Boiler House, Sewage Disposal Plant, Garage, Railroads, Incinerator, Pump House, and Safety. The division General Service was comprised of the departments of: Welfare, Personnel, Cafeteria, Inspection, Operating Standards, Laboratory, Traffic, Hospital, War Service, Purchasing and General and Works Manager. Administrative Service included Factory Cost, Tabulating Cost, Stores Ledger, Invoice, General Accounting, Treasury and General Office.

Each overhead item was classified as either a fixed or a variable expense.

FIXED EXPENSES

The fixed expenses included the salaries of the executive and supervisory personnel, taxes, insurance, interest, as well as certain administrative expenses of a fixed nature. The all-important fixed expense of Depreciation was missing because the entire buildings, all equipment of shop and office alike were the property of the Defense Plant Corporation. The fixed expenses were set up on a monthly basis which was then put on a weekly and from there on a daily basis. The daily report did not indicate this construction, but the underlying papers were built up in this manner.

VARIABLE EXPENSES

The variable expenses comprised indirect wages and salaries, indirect material, power, water, heat, payroll taxes and compensation insurance. Since these shells were manufactured on a fixed price supply contract, ordinary commercial selling expenses were not an item of cost. The figures of the variable expenses to be used for the daily report were compiled in a different way. Payroll tabulations of the previous week and material tabulations that included all charges to the end of the week were used to build the variable expense figure. Payroll taxes and Compensation insurance were percentages of the payroll. Power, Water, and Heat costs were based on figures computed by the plant Engineering Department. In the last analysis the figures in this weeks' daily profit and loss report were last week's actual charges. This method kept deviations to a minimum.

As a definite burden percentage had been agreed upon with the Ordnance Department, the cost department prepared for management a report comparing contract burden percentage with actual burden incurred. Naturally, as production reached its peak the gap between these rates became immaterial.

OTHER DIRECT COSTS

The first item, **Tooling,** included such special tools as dies, jigs, fixtures, manufacturing aids, tools, chucks, and gages that are customarily amortized or depreciated over a certain number of years or on the basis of production quotas. The original contract set aside a certain amount for this type of costs to be amortized at a definite dollar value in the unit

price of the shell. Cutting tools were, as stated, charged to material cost when withdrawn from stores for production.

The problem of controlling these special tools was made quite difficult by the methods requested by the Ordnance Department. Tools that generally are component parts of the machine had to be segregated cost-wise and charged to the production contract, while the basic unit and its permanent parts were billed to the Ordnance on the Vendor's Shipping Document. The control of these 'Tooling' items was two-fold: (1) any acquisition of new tools had to be checked against the amount of the original appropriation, and (2) the cost of all special tools had to be amortized on the basis of total production of the contract.

The second item, **Training,** comprised the costs that were collected by the factory cost clerks in the shop in the early stages of production from the operators whose names had been reported by the shop superintendents. Ordinarily, training costs are considered pre-production costs. As the contract, however, allowed a definite amount for training purposes, a shop order number was issued to which all such costs were posted. The amount was amortized over the shells on order.

Any **Other costs** in connection with the contract such as pre-production costs and/or starting load were amortized on the basis of the total number of shells of the contract. As production progressed, these costs were under continuous scrutiny in order to hold them at a minimum and in accordance with the limits set by the contract.

DAILY PROFIT OR LOSS ON SHIPMENTS

The total cost per unit was subtracted from the sales price to arrive at a profit or loss per unit for one day. This figure was multiplied by the quantity shipped that day. As a definite sales price and cost per unit had been agreed upon with the Ordnance Department, management was able to compare day by day actual results with contract stipuluations.

CONCLUSION

Throughout this discussion it was intended (1) to show how this daily profit and loss report was built up, and (2) how it enabled management to put this war task on a successful and efficient basis. It is admitted that many problems were omitted. But the subject matter under discussion indicates how the problem of cost control for this job was solved in this particular enterprise. The unique methods of costing and controlling the elements of labor, material and burden employed here were believed to be well fitted for this type of work, the manufacture and machining of 8" and 240 mm. shells, and, after all, the results obtained spoke for themselves. In the last analysis, costing methods should be designed so that adverse conditions can be brought to the attention of management where quick and decisive action can be taken immediately. To-day more than ever before the success of a business depends upon the teamwork of labor and management. To these team efforts the cost executive contributes his share through the creation of costing methods and systems that will present cost information promptly, understandably and in harmony with the requirements of all parties concerned.

DAILY PROFIT AND LOSS REPORT

Date .....

MATERIAL	Est.	Standard					Total
Direct							
Indirect							
Total Material Cost							

LABOR	Est.	Standard	Variances					Total
Department								
Roughing								
Heat Treating								
Machining								
Final Machining								
Finishing								
Tooling								
Total Labor Cost								

BURDEN	Est.	Standard		Total
Productive Depts.				
Productive Service				
Plant Service				
General Service				
Administrative				
Total Burden				
Sub-Total (M + L + B)				

OTHER DIRECT COST	Est.		
Tooling			
Training			
Others			
Total			
Total Cost per Unit			
Selling Price p. Unit			
Profit or Loss p. Unit			

SUMMARY

Profit—Loss on units shipped this day	$
Profit—Loss on units shipped	
Profit—Loss on units shipped	
Total Profit—Loss to Date	$
Selling price of units shipped to date	$

Form No. 1